

**Jawaharlal Institute of Postgraduate Medical Education and Research
(JIPMER) Karaikal**



Aseptic Glove Donning and Doffing for Clinical Practice
Module Version 1.0

Dr Karthik Balajee Laksham

Dr. Prabakar G

Dr. Balasubramanian A

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Version 1.0



Karaikal Campus

Authors

- Dr Karthik Balajee Laksham, Associate Professor, Department of Community Medicine, JIPMER Karaikal
- Dr. Prabakar G, Associate Professor, Department of Surgery, JIPMER Karaikal
- Dr. Balasubramanian A, Assistant Professor, Department of Surgery, JIPMER Karaikal

Signatures

Dr. Karthik Balajee Laksham

Dr. Prabakar G

Dr. Balasubramanian A

L. Karthik Balajee
Prabakar G
Balasubramanian A



Reviewer

Dr. Jeyakumari D

Jeyakumari D

Approved by

Dean, JIPMER Karaikal

Dr. Kusa Kumar Shaha

डॉ. कुश कुमार शाहा

Dr. KUSA KUMAR SHAHA

संकायाध्यक्ष / DEAN

जिपमेर कारैकाल / JIPMER KARAİKAL

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Aseptic Glove Donning for Clinical Practice

Introduction and Rationale

Aseptic glove donning is an essential skill for all healthcare professionals. It helps to maintain cleanliness during medical procedures, prevents infections, and keeps patients and healthcare workers safe. Hospital-acquired infections (HAIs) are a significant global cause of morbidity and mortality.¹ HAIs are infections acquired after 48 hours of hospital admission that were neither present nor incubating at the time of admission.² These infections primarily include central-line-associated bloodstream infections (CLABSIs), catheter-associated urinary tract infections (CAUTIs), ventilator-associated pneumonia (VAP), and surgical site infections (SSIs).³ They affect approximately 1 in 31 hospitalised patients, with intensive care units contributing 9–20% of these infections.^{4,5}

This training module focuses on teaching glove donning as part of infection control. It is based on Competency-Based Medical Education (CBME), which helps students learn and apply skills they will use in real-life clinical situations. Structured training programs in aseptic techniques have significantly reduced surgical site infections (SSIs). For instance, a study by Mohsen et al. (2020) reported that SSIs can occur in up to 30% of surgical procedures and account for approximately 14% of hospital-acquired infections (HAIs).⁶ The study emphasized that education and training programs are essential to improve nurses' knowledge and practices in preventing SSIs. The World Health Organization (WHO) has also highlighted the importance of aseptic techniques in preventing infections during surgical procedures. The WHO Surgical Safety Checklist, which includes steps to ensure aseptic conditions, has significantly reduced postoperative complications and infections. (World Health Organization (WHO) 2009)

By learning how to don and doff gloves properly, students can avoid spreading germs, improve patient safety, and prepare for future healthcare roles. This module ensures students practice these skills and understand their importance in everyday medical work.

Gloves and Their Importance

Gloves are critical for infection prevention in healthcare, safeguarding patients and healthcare personnel from exposure to infectious materials. They act as a protective barrier, preventing the transmission of microorganisms during medical procedures. Sterile gloves are essential for invasive procedures and when in contact with sterile sites, tissues, or body cavities. These gloves help prevent surgical site infections and minimise the risk of exposure to bloodborne pathogens and other potentially infectious materials. Gloves ensure a sterile environment is maintained during procedures and protect healthcare personnel during direct contact with blood, body fluids, nonintact skin, or contaminated equipment. They are also vital when dealing with patients colonised or infected with drug-resistant pathogens such as *Vancomycin-resistant enterococci* (VRE), *Methicillin-resistant Staphylococcus aureus* (MRSA), and *Respiratory Syncytial Virus* (RSV)

Types of Gloves

Gloves are made from various materials, each suited to specific applications. Latex gloves are widely used in medical settings for their elasticity and comfort, while nitrile gloves offer enhanced chemical and puncture resistance. Vinyl gloves provide an alternative for individuals with latex allergies, and neoprene gloves are valued for their chemical resistance. Specialized materials such as Kevlar and polyurethane are used in gloves for cut-resistance, heat-resistance, or improved grip. The choice of glove material depends on the procedure and the level of protection required.

Double Gloving

Double gloving has been demonstrated to reduce the risk of pathogen exposure significantly.⁸ It effectively addresses the issue of unnoticed micro-punctures found in up to 24% of sterile gloves during surgical procedures.⁹ Double gloving is recognised as an effective practice to enhance safety for healthcare workers and patients, although it does not eliminate the risk of cross-contamination after surgery.

Hand Hygiene and Glove use

The glove is not a substitute for hand hygiene. Hand hygiene before and after glove use should be performed to prevent possible cross-contamination. Gloves should be worn for patient care

activity. It must be changed between patient contacts and separate procedures on the same patient. No hand hygiene over the gloved hand is recommended.

CBME Competency Overview

This module focuses on Microbiology Competency MI 8.7, which aligns with the Competency-Based Undergraduate Curriculum for The Indian Medical Graduate Volume II (NMC, 2018) by the National Medical Commission (NMC). The competency-based approach equips students with the skills to perform infection control practices independently and effectively in clinical settings.

Competency Table

Category	Details
Competency Number	MI 8.7
Description	Demonstrate infection control practices and use of Personal Protective Equipment (PPE).
Domain	Skill
Level (Miller's Pyramid)	Perform
Core Competency	Yes
Teaching-Learning Method	DOAP (Demonstrate, Observe, Assist, Perform) session.
Assessment Method	Skill assessment using validated checklists.
Certification Requirement	Competency in hand hygiene and PPE use must be demonstrated at least three times each to be certified.
Vertical Integration	Surgery
Horizontal Integration	Community Medicine

Competency Framework Mapping

This module teaches learners to demonstrate aseptic techniques, such as proper glove donning. Learners progress through milestones from "knows" (understanding the concept) to "knows how" (practical understanding), "shows how" (guided demonstration), and finally, "does" (independent practice in clinical settings) as per Miller's Pyramid .

Competency Milestones and Strategies

Milestone	Description	Teaching Strategy	Assessment Method
Knows	Learners understand the theoretical importance of glove donning & doffing and its role in infection control.	Interactive lecture using visual aids	Short quizzes or multiple-choice questions (MCQs)
Knows How	Learners can explain and sequence the steps of glove donning & doffing, connecting theoretical knowledge to practical steps.	Group discussions or checklist-based instruction	Written or oral explanation of steps
Shows How	Learners demonstrate glove donning & doffing under supervision, showcasing their ability to perform the task in a controlled environment.	DOAP (Demonstrate, Observe, Assist, Perform)	Direct Observation of Procedural Skills (DOPS)
Does	Learners independently don & doff the gloves in clinical settings, applying the skill in real-world scenarios.	Simulated scenarios or hands-on clinical practice	Faculty observation and checklist-based evaluation

The Miller's Pyramid, mapping the transition from "Knows" to "Does" in glove donning & doffing is shown in Figure 1.

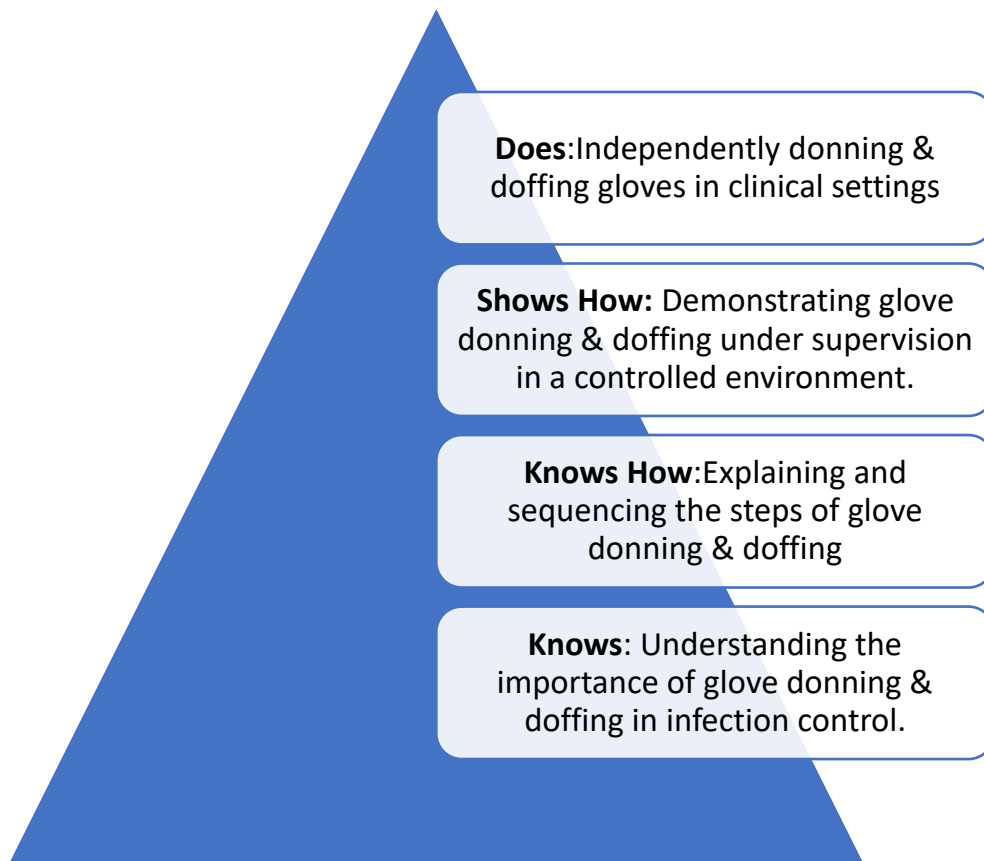


Fig 1: Miller's Pyramid, mapping the transition from "Knows" to "Does" in glove donning & doffing

Skill Training Framework: Criticality vs. Feasibility Matrix

The Criticality vs. Feasibility Matrix categorises skills based on their clinical importance and institutional feasibility for training.

Category	Action
High Criticality, High Feasibility	Prioritized for certification for independent practice.
High Criticality, Low Feasibility	Capacity building in a skill lab or simulation.
Low Criticality, High Feasibility	Opportunity to observe or assist.
Low Criticality, Low Feasibility	Awareness of the skill is sufficient.

Glove donning is categorised as High Criticality and High Feasibility, making it essential for structured training, skill assessment, and certification.

Methodology

The module was iteratively developed, beginning with competency mapping based on CBME guidelines. Assessment tools, such as the DOPS checklist, were validated through pilot testing with a small group of students. The training program targeted 13 interns and included PowerPoint presentations and structured checklists to support preparation and facilitate learning. Data from evaluations and feedback informed iterative improvements, ensuring the module's comprehensiveness and alignment with CBME principles. The objective was to train learners in aseptic glove donning, aligned with CBME principles and ensuring the development of essential clinical competencies.

Steps for Glove Donning and Doffing

Preparation:

1. Gather Supplies:

- Ensure the availability of a sterile glove pack, a clean working surface, and any additional necessary PPE.
- Select appropriately sized gloves for a snug fit, ensuring dexterity and ease of handling objects.
- Confirm the patient has no latex allergy and prepare them for the procedure.

2. Setting Up the Sterile Area: Arrange a sterile workspace using a sterile sheet or trolley, preferably at waist height.

3. Inspecting and Opening the Packaging:

- Check the glove packaging for sterility, expiry date, intact seals, and dryness.
- Open the outer packaging at the designated precut area without contaminating the inner sterile package. Place the inner package directly or using a sterile instrument on the sterile area.

4. Hand Hygiene:

- Remove all jewellery and ensure nails are trimmed and free from abrasions or sores (cover or inform a supervisor if necessary).
- Roll up sleeves 2–3 inches above the elbow.
- Wash hands thoroughly with soap and water, removing visible contaminants, followed by an alcohol-based hand rub. Dry hands completely before proceeding.

Procedure:

1. Donning the First Glove:

- Place the inner sterile glove package on the sterile surface and open it to reveal the gloves.
- Using the non-dominant hand, pick up the dominant hand's glove by the inside cuff at its folded edge. Avoid touching the glove's outer surface.
- Identify the glove's orientation, slide the dominant hand into the glove, and pull it over the fingers, leaving the cuff folded at the wrist.

2. Donning the Second Glove:

- Insert the fingers of the gloved dominant hand (excluding the thumb) under the folded cuff of the second glove.
- Lift the glove, check its orientation, and slide the non-dominant hand into the glove. Pull it over the fingers and unfold the cuff to cover the wrist.

3. Final Adjustment and Check:

- Unfold the cuff of the dominant hand glove using the gloved non-dominant hand.
- Ensure both gloves fit properly without tears or breaks.
- Interlock gloved hands, keeping them above the waist and below shoulder level, and at least six inches away from clothing.

4. Doffing the Gloves:

- Grasp the outer surface of one glove at the cuff or palm and gently pull it off, turning it inside out. Hold the removed glove in the still-gloved hand.
- Insert the fingers of the ungloved hand inside the cuff of the remaining glove and peel it off inside out, enveloping the first glove.
- Dispose of the gloves in a red color-coded bin.
- Perform hand hygiene using soap and water or an alcohol-based hand sanitiser.

This sequence ensures asepsis throughout the donning and doffing process, reducing the risk of contamination and maintaining infection control standards. The photographs of the steps of glove donning and doffing are attached herewith to provide visual context and supplement learning resources

Training Program on Aseptic Glove Donning & Doffing for Clinical Practice

Duration: 90 Minutes

Learning Objectives

1. Ensure learners can perform aseptic glove donning precisely, following standard operating procedures.
2. Develop consistency in aseptic technique to prevent contamination and enhance patient safety.
3. Provide effective feedback to improve skills using Direct Observation of Procedural Skills (DOPS) and DOAP methodologies.
4. Gather insights through qualitative and quantitative feedback on learners' learning experiences.

Training Program

The session is structured into four components.

- First, a **pretest evaluation** will assess the baseline skill levels of participants using a DOPS checklist. This provides a benchmark to measure subsequent improvements.
- The **interactive training session** will employ the DOAP methodology to enhance learner engagement and ensure hands-on experience in small groups.
- Following the training, a **post-test evaluation** will be conducted using the same DOPS checklist to measure skill improvement and competency attainment.
- Finally, **feedback collection** will involve gathering quantitative and qualitative data through a structured Google Form to evaluate the learners' training experience and identify areas for enhancement.

Prerequisite Knowledge

Before participating in the glove-donning training module, learners should have a foundational knowledge of aseptic techniques and an understanding of the risks associated with surgical infections. Providing access to essential resources, such as reading materials or instructional videos on infection control principles, prepares learners for the practical aspects of the training. These preparatory materials ensure that participants enter the session with a baseline understanding, enabling more effective learning and application of skills.

Lesson Plan

Duration	Activity	Lead	Objective	Methodology
15 min	Introduction to Aseptic Technique and Importance of Glove Donning	Surgery Faculty	Provide context and emphasize importance	Interactive discussion
15 min	Pretest (DOPS)	Surgery Faculty	Assess baseline skills	Observation & scoring with checklist
20 min	Small-Group Demonstration (DOAP)	Surgery Faculty	Demonstrate step-by-step glove donning	Guided demonstration with real-time feedback
10 min	Hands-On Practice (DOAP)	Interns/Students	Practice in supervised setting	Individual practice with feedback
20 min	Post-test (DOPS) & Remedial	Surgery Faculty	Evaluate improvement in skill	Observation & scoring with checklist
10 min	Feedback Collection	Faculty Facilitator	Gather insights on learning	Survey with qualitative and quantitative questions

Resources and Equipment

- Sterile Latex gloves in various sizes- 3 pairs per learner + 3 pairs per teacher
- Hand Disinfectant (One bottle per station)
- Visual aids (posters, videos, diagrams of proper technique).
- Dedicated sterile practice space or simulation lab.

Teaching Techniques and Principles

1. **DOAP (Demonstrate, Observe, Assist, Perform):** Small groups enable learners to observe the proper technique, participate in assisted practice, and perform the skill independently. This approach enhances competency through scaffolded learning.
2. **Formative Feedback:** Faculty provide real-time formative feedback during practice, focusing on strengths and improvement areas. Feedback is specific, actionable, and reinforces learning.
3. **Reflection:** After the post-test, learners are encouraged to reflect on their performance and understand the significance of the aseptic technique.

Instructions to the Learner

For the station, 'Donning Sterile Gloves for Catheterization', the following instruction is provided to the learners :

*"This station is designed to train and evaluate students on the proper technique for donning sterile gloves in preparation for a urinary catheterisation procedure. The scenario involves a 65-year-old male patient experiencing urinary retention, and you, as an intern in a hospital setting, must don the gloves while adhering to aseptic practices. You are allotted **5 minutes** to complete the task. A sterile table, hand wash station, and disposal bin are provided to facilitate the process. Follow the steps outlined in the checklist to don sterile gloves correctly, ensuring sterility is maintained throughout the procedure. A beep sound will signal the end of the allotted time. Doff the gloves at the end of the procedure, as per standard protocol. Your ability to maintain sterility and adhere to proper technique will be assessed during this exercise."*

Assessment Tool

We developed the DOPS (Direct Observation of Procedural Skills) Checklist for Aseptic Glove Donning and Doffing to assess learners' competency in this critical clinical skill. Using standard reference,¹⁰ we designed the checklist to evaluate key steps, including:

1. Preparation: Gathering supplies and setting up a sterile field correctly.
2. Hand Hygiene: Performing proper hand hygiene before and after glove use.
3. Glove Donning: Wear gloves on both hands without contamination and make proper adjustments.
4. Aseptic Doffing: Removing gloves aseptically, avoiding breaches in sterility.

5. Disposal: Disposing of gloves appropriately and completing the procedure with hand hygiene.

Each step is scored against a validated rubric, with a maximum score of 20 points. We developed the scoring system by consensus to ensure objectivity and consistency. After each assessment, we provide immediate feedback to address errors and reinforce proper techniques. Students scoring below 15 or breaching asepsis will receive immediate feedback and must repeat the procedure under supervision to demonstrate competency. This checklist not only measures technical proficiency but also standardizes teaching and assessment. The DOPS checklist is given as Annexure 1.

Feedback Rubric: Trainers provide structured feedback based on observed performance with specific suggestions for improvement.

Data Collection and Analysis

1. Pretest and Post-test Scores: Analyze scores to assess improvement, reflecting the module's effectiveness.
2. Feedback Analysis: Aggregate quantitative feedback and thematic analysis of qualitative responses to identify strengths and areas for enhancement.
3. Competency Tracking: Track individual progress to ensure mastery before independent practice.

Evaluation

1. Measure effectiveness through score improvements and feedback, aligning with CBME's focus on skill mastery.
2. Longitudinal Impact: Encourage periodic assessment in future rotations to reinforce and sustain the skill.

Application of Kirkpatrick Model to the Aseptic Glove Donning Training

The Kirkpatrick Model was applied to evaluate the effectiveness of the training program across four levels, as depicted in Figure 2.

Level	Purpose	Assessment Method	Example in Module
Reaction	Measure participant satisfaction with the training.	Structured feedback via Google Forms with quantitative ratings and qualitative comments.	Feedback on training relevance informed refinements to the module.
Learning	Assess knowledge and skills gained during the training.	Pretest and post-test evaluations using the DOPS checklist.	Improved post-test scores demonstrated enhanced competency.
Behavior	Evaluate skill application in clinical settings.	Periodic observations during clinical postings.	Consistent adherence to aseptic glove donning in clinical practice.
Results	Analyze broader outcomes like infection control.	Long-term studies or infection control audits.	Reduction in infection rates linked to aseptic practices.

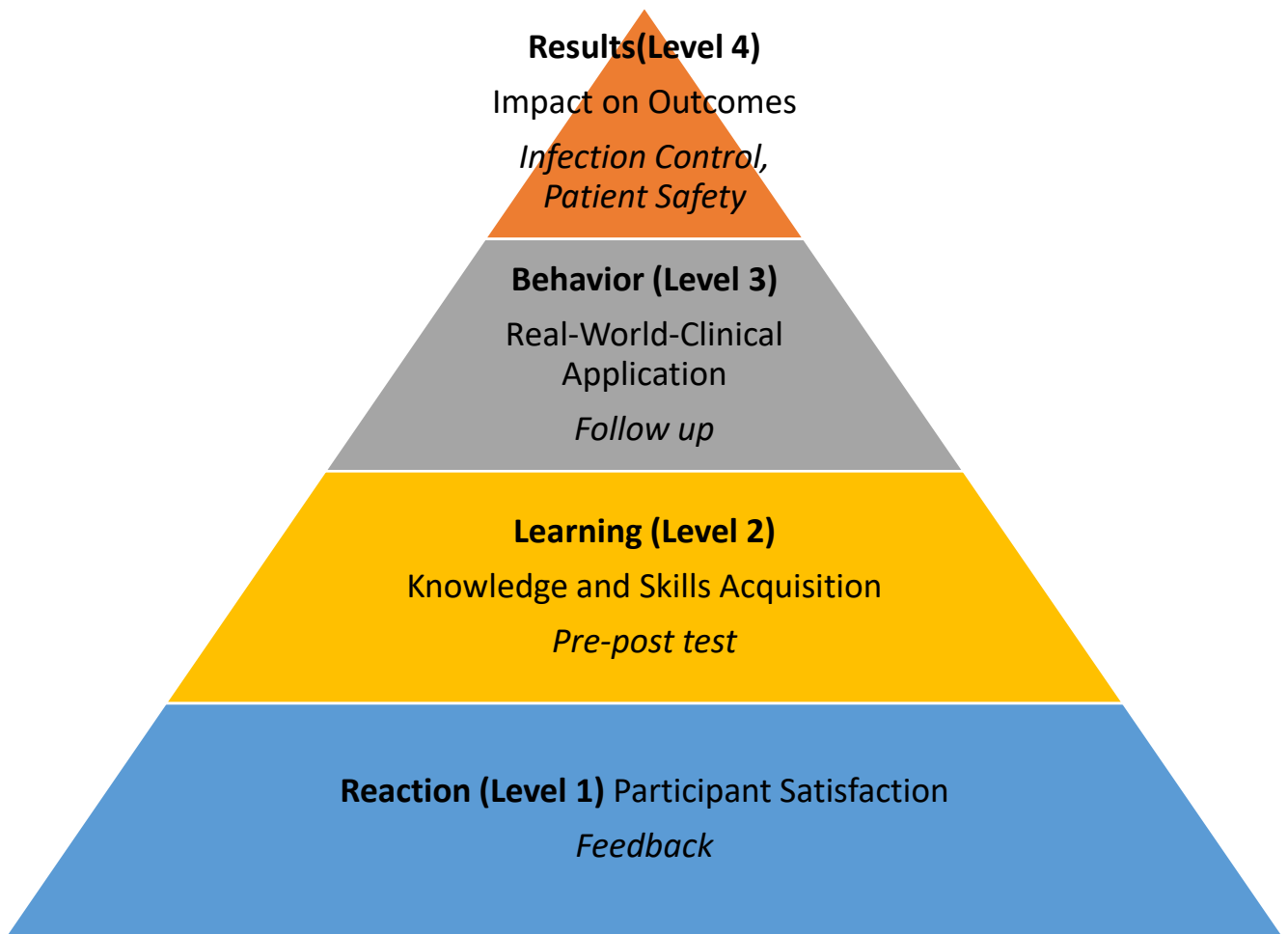


Fig 2: Kirkpatrick Model of evaluation of Glove Donning Training

This model ensures a comprehensive training program evaluation, from immediate participant feedback to long-term clinical outcomes. The figure illustrates the alignment of each level with the program's objectives

Learners feedback

Learners' Feedback will be crucial in refining the glove-donning module. The Google Form developed for the feedback included:

1. Quantitative ratings on the training's clarity, relevance, and effectiveness.

Instructions: Please rate each statement below on a scale of 1-5, with one being "Strongly Disagree" and five being "Strongly Agree."

Statement	Rating (1-5)
The training was well-organized and relevant to clinical practice.	
I feel confident in my ability to perform glove donning aseptically.	
The DOAP demonstration was clear and easy to follow.	
The pretest and post-test assessments were fair and helpful.	
I received valuable feedback to improve my skills.	

2. Open-ended questions on areas for improvement and suggestions.

1. What aspects of this training did you find most helpful?
2. How could this module be improved?
3. Additional comments:

Training session on 19/11/2024

The aseptic glove-donning doffing training program was conducted on 19th November between 3- 4.30 PM for 13 interns at Lecture Hall, Academic Block JIPMER Karaikal.

Dr. Prabakar, Associate Professor of the Department of Surgery and Dr. Balasubramanian, Assistant Professor of the Department of Surgery, conducted the session. Dr Karthik Balajee Laksham, Associate Professor of the Department of Community Medicine and Dr Arul, Assistant Professor of the Department of Orthopaedics, were the observers.

Feedback Summary

Quantitative and qualitative feedback was collected using structured Google Forms. Below is a summary of the feedback and evaluation outcomes:

Students feedback on a Scale 1-5 (1 - Strongly Disagree to 5 - Strongly Agree)

Summary	Training was well-organized & relevant to clinical practice	Demonstration was clear & easy to follow	Pretest & post-test assessments were fair & helpful	I feel confident in my ability to perform glove donning & Doffing aseptically	I received valuable feedback to improve my skills.
Median	5	5	5	5	5
Minimum	4	5	4	4	3
Maximum	5	5	5	5	5

Students feedback : Positive Aspects (What Learners Found Most Helpful)

Key Themes	Examples of Feedback
Demonstrations were highlighted as most helpful.	"Demonstration"
Hands-on activities and direct experience improved skills and engagement.	"Hands-on session", "Hand to Hand experience"
Explanation of donning & doffing technique was valued	"Explanation of the donning and doffing technique"
Feedback provided during session was helpful	"Received valuable feedback to improve my skills"
Proper steps were beneficial for learning the procedure	"Proper steps"

Student feedback: Challenges Faced (What Did Not Go Well)

Key Themes	Examples of Feedback
No major issues raised by most participants	"Nil", "Nothing"
Limited options in glove sizes	"More options in the size of gloves could have been given."
Timing of the training	"Timing of training."
Lack of classroom preparation prior to the session	"Classroom can be arranged prior."

Student feedback: Suggestions for Improvement

Key Themes	Examples of Feedback
Smaller group sizes for better engagement	"Sample size of interns/doctors can be made a little smaller to increase engagement."
Pre-arrangement of the classroom	"Classroom can be arranged prior."
Inclusion of slides on surgical site infection incidence.	"Can include slide on surgical site infection incidence."
Use of videos in demonstrations.	"Can involve videos."

Student feedback: Additional Comments or Suggestions

Key Themes	Examples of Feedback
The session was well-organized and appreciated overall.	"This was a very helpful session. Learnt so much in such a well-organized and well-presented manner."
Learners valued the interactive and feedback-driven approach.	"Liked this way of learning the procedure."

The comments were largely positive, with minimal critical feedback. The key themes emerged from open-ended responses:

- **Strengths:** Interns appreciated the clarity of demonstrations and the hands-on practice. Real-time feedback was deemed highly beneficial.
- **Suggestions for Improvement:** Some interns suggested to improve the Trainer Learner ratio

Student Performance Evaluation

Students' performance during the pretest and post-test phases is illustrated in **Figure 3**, which depicts the frequency distribution of their scores. Pretest scores exhibit a broader distribution with lower peaks, indicating variability in initial performance levels. Conversely, post-test

scores are concentrated at higher values, with most students achieving scores between 18 and 20. This shift highlights significant improvement in performance following the training.

Figure 4 provides a Box Plot Comparison of Pretest and Post-Test Scores, visually representing the score distributions. The pretest median score is considerably lower, with a wider interquartile range, indicating greater variability in performance. In contrast, the post-test scores show a higher median and a narrower interquartile range, reflecting more consistent and improved performance after the intervention.

The Task-Wise Comparison of Scores is presented in **Figure 5**, which compares mean scores for individual tasks between the pretest and post-test. Significant improvements are evident across all tasks, with the greatest gains observed in donning the second glove and gathering supplies, demonstrating enhanced understanding and skill acquisition. Tasks such as hand hygiene post-donning and setting up the sterile area also showed marked progress, underscoring the effectiveness of targeted training in improving procedural accuracy and consistency.

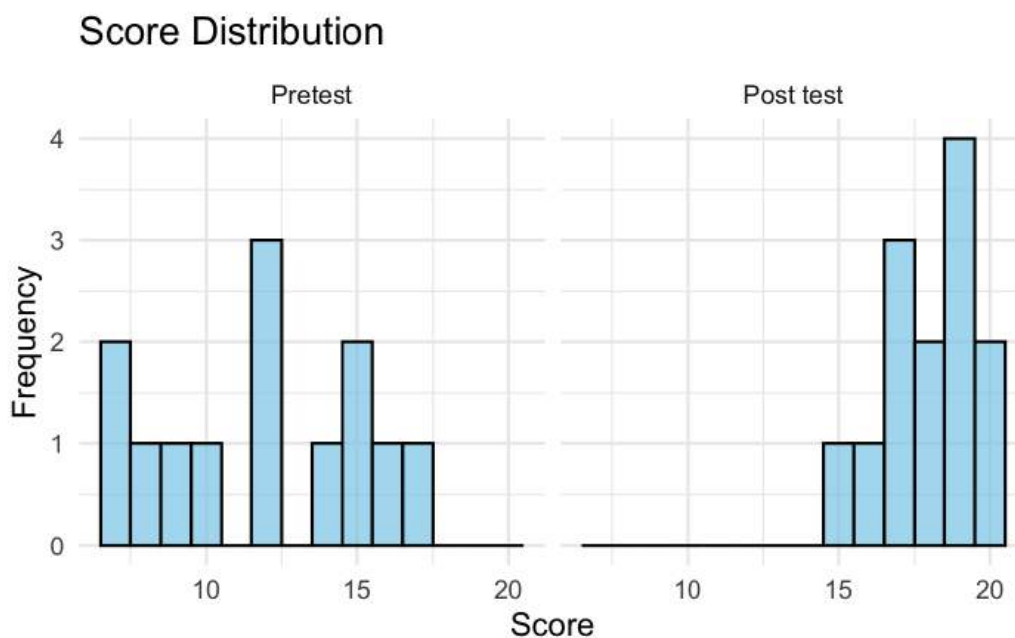


Fig: 3 The frequency distribution of Learner scores

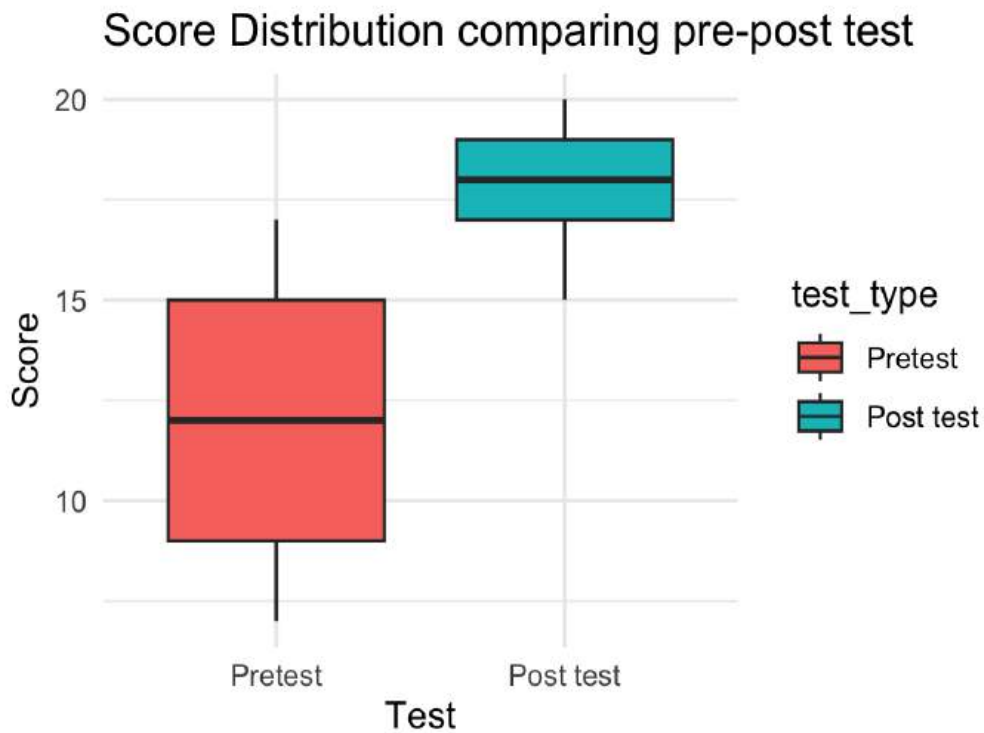


Fig 4: Box Plot of students' scores in the pretest and post-test

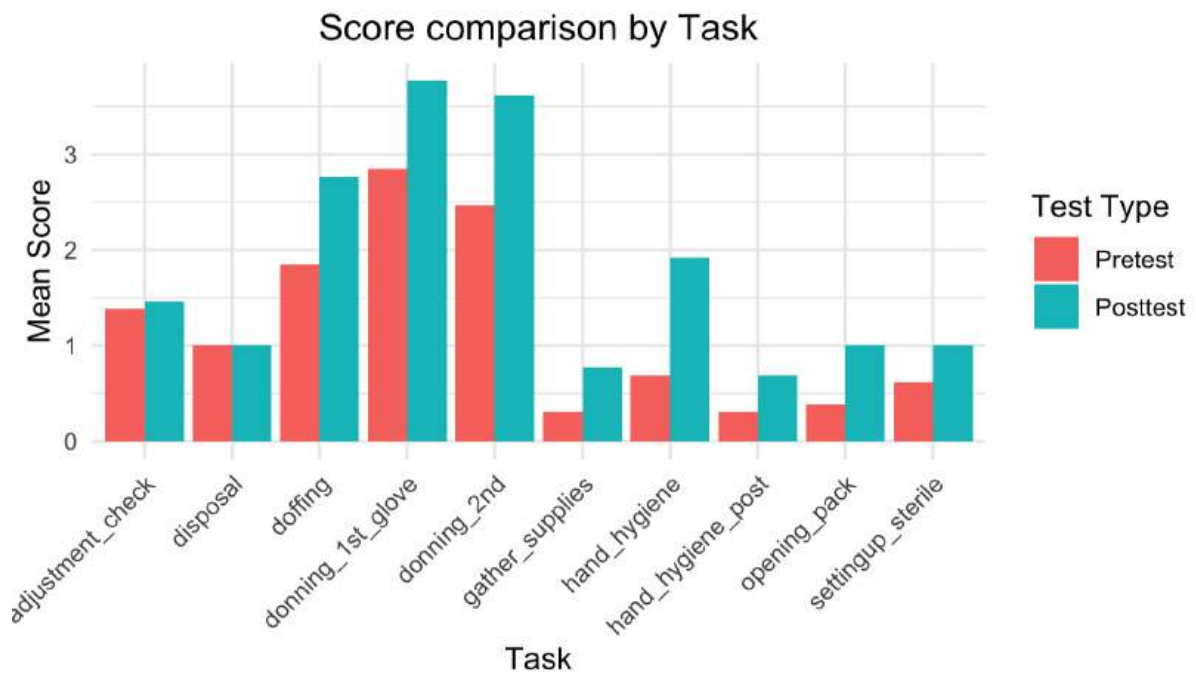


Fig 5: The task-wise comparison of the scores of training session

Descriptive Statistics of Students Evaluation (maximum possible score is 20)

Test Type	Mean	Median	SD	Min	Max	N
Pretest	11.8	12	3.44	7	17	13
Post test	18.0	18	1.53	15	20	13

Statistical Analysis: Both pretest and post-test scores were normally distributed (Shapiro-Wilk test: Pretest $W = 0.934$, $p = 0.3835$; Post-test $W = 0.935$, $p = 0.3578$). A paired t-test comparing pretest and post-test scores showed a significant improvement in skills after training ($t = 6.16$, $p = 4.873 \times 10^{-5}$).

Results

- Pretest and post-test evaluations using the DOPS checklist indicated an average improvement of 6.2 points in scores across all criteria.
- Interns demonstrated significant improvement in maintaining aseptic techniques, particularly in the steps related to glove handling and placement

Trainer Feedback

The trainers observed that the session generated greater student interest than routine classes. The interactive and hands-on nature of the session contributed significantly to student engagement and learning. Faculty members also found it a valuable opportunity to enhance their teaching skills. A notable improvement was observed in student performance, as reflected by the differences between pretest and post-test scores. Small group teaching was particularly effective in improving recollection and reproducibility of the skills taught.

However, the session posed certain challenges. It was resource-intensive, requiring significant time, manpower, and materials. Additionally, biomedical waste was generated during the session, highlighting the need for sustainable practices in similar training programs.

Suggestions by Trainers for Improvement:

1. Procure better-quality unsterile gloves with appropriate packaging to enhance the simulation experience.
2. Introduce low-fidelity mannequins to improve skill demonstration and practice.
3. Expand the scope of skill-based training by identifying additional topics within the subject for similar sessions.

These insights will guide the refinement of future sessions.

Glossary

- **Asepsis:** The absence of bacteria, viruses, and other microorganisms to prevent infection.
- **Catheter-associated urinary tract infections (CAUTIs):** Infections associated with using urinary catheters.
- **CBME:** Competency-Based Medical Education.
- **Centres for Disease Control and Prevention (CDC):** A national public health institute in the United States.
- **Central-line-associated bloodstream infections (CLABSIs):** Infections associated with central venous catheters.
- **DOPS:** Direct Observation of Procedural Skills.
- **DOAP:** Demonstrate, Observe, Assist, Perform.
- **HAI:** Hospital-acquired infections.
- **MCQ:** Multiple-Choice Questions.
- **NMC:** National Medical Commission (Formerly Medical Council of India -MCI).
- **SSI:** Surgical site infections.
- **Ventilator-associated pneumonia (VAP):** Pneumonia occurring in patients on mechanical ventilation.
- **World Health Organization (WHO):** A specialised agency of the United Nations responsible for international public health

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DOPS checklist for Aseptic Glove Donning and Doffing

Faculty :

Date :

Name	Gather Supplies (1)	Setting up Sterile area (1)	Opening Pack (1)	Hand Hygiene (2)	Donning First Glove (4)	Donning Second Glove (4)	Adjustment & Check (2)	Doffing Gloves (3)	Glove Disposal (1)	Hand Hygiene after Doffing (1)	Total (20)		Assessor Feedback

Gather supplies



Remove wristwatch, and jewellery & fold the shirt sleeves



Setting up the Sterile area



Package Inspection and Opening



Hand hygiene



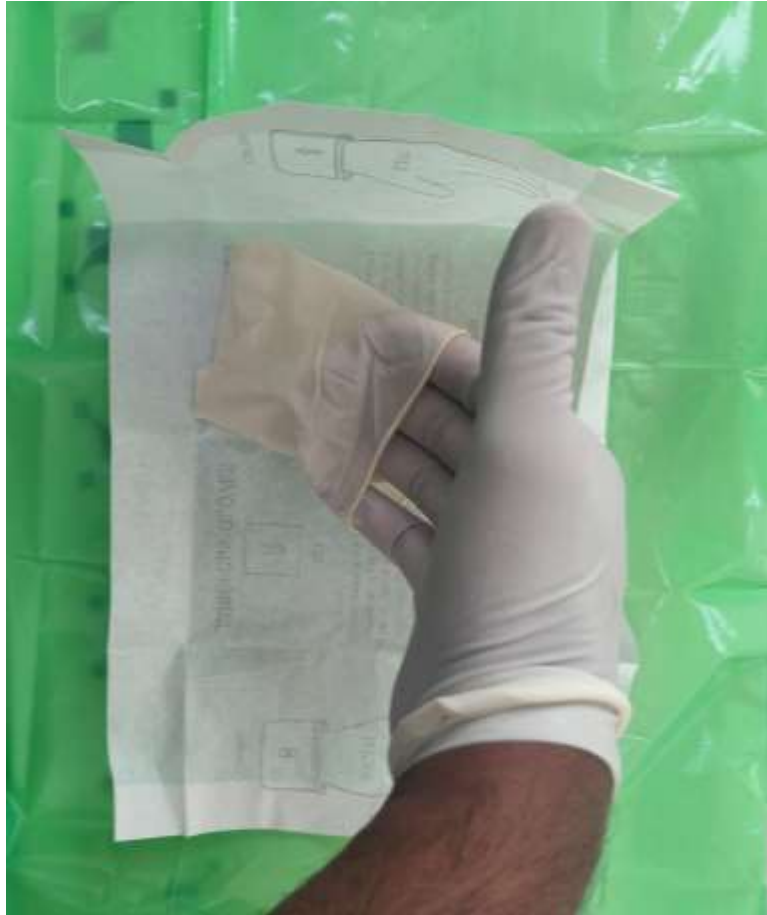
Donning the dominant hand



Donning the dominant hand



Donning the non-dominant hand



Final adjustment and checking



Doffing



Doffing



Hand hygiene

